CLAIMS

1. A method for retrieving local near-surface material information comprising the steps of:

providing a group of receivers comprising at least one buried receiver and at least one surface receiver;

recording a seismic wavefield;

estimating a propagator from said recorded seismic wavefield;

inverting said propagator; and

retrieving said near-surface material information.

2. The method of claim 1, wherein the group of receivers comprises a plurality of surface receivers.

3. The method of claim 1 or claim 2 wherein the receivers are geophones.

4. The method of claim 1, wherein the buried receiver is a three-component geophone.

5. The method of claim 1, wherein the buried receiver is located at a depth of less than 10 meters.

6. The method of claim 1, wherein the buried receiver is located in a borehole.

7. The method of claim 1, wherein the seismic wavefield comprises P and S waves.

8. The method of claim 1, wherein the propagator is calculated for the whole seismogram.

9. The method of claim 1, wherein the propagator is a coupled P-SV propagator.

10. The method of claim 1, further comprising the step of:

assuming that the recorded seismic wavefield can be written as a superposition of plane waves.

11. The method of claim 1, further comprising the steps of:

defining propagator coefficients, which are wavefield decomposition filters, for the free-surface plane wave; and

extrapolating said coefficients to depth Δz.

12. The method of claim 1, wherein the propagator P(x, t) is obtained by calculating the inverse Fourier transform of the following coefficients:

$$
\begin{aligned}
P_{11}(\omega,x) &= \Re\left[\frac{v_x(\omega,x,\Delta z)}{v_x(\omega,x,0)}\right] + \Im\left[\frac{v_z(\omega,x,0)}{v_x(\omega,x,0)}\right]\Im\left[P_{13}(\omega,x)\right] \\
P_{33}(\omega,x) &= \Re\left[\frac{v_z(\omega,x,\Delta z)}{v_z(\omega,x,0)}\right] + \Im\left[\frac{v_x(\omega,x,0)}{v_z(\omega,x,0)}\right]\Im\left[P_{31}(\omega,x)\right], \\
P_{13}(\omega,x) &= i\,\Im\left[\frac{v_x(\omega,x,\Delta z)}{v_x(\omega,x,0)}\right]\left\{\Re\left[\frac{v_z(\omega,x,0)}{v_x(\omega,x,0)}\right]\right\}^{-1}, \\
P_{31}(\omega,x) &= i\,\Im\left[\frac{v_z(\omega,x,\Delta z)}{v_z(\omega,x,0)}\right]\left\{\Re\left[\frac{v_x(\omega,x,0)}{v_z(\omega,x,0)}\right]\right\}^{-1}.
\end{aligned}
$$

where , $\Re[v(\omega,x,z)]$ denotes the real part of $v(\omega,x,z)$ and $\Im[v(\omega,x,z)]$ is the imaginary part of $v(\omega,x,z)$, v_x is the inline velocity component and v_z the vertical velocity component.

13. The method of claim 9, wherein the inversion of the P-SV propagator for material properties is carried out in the frequency domain.

14. The method of claim 1, wherein the inversion for material properties is carried out for the surface wave component of the seismic signal.

15. The method of claim 1, wherein the propagator used is for an anisotropic or a transversely isotropic medium.

16. A method for retrieving local near-surface material information comprising the steps of:

obtaining seismic wavefield information from a group of receivers comprising at least one buried receiver and at least one surface receiver;

estimating a propagator from said recorded seismic wavefield;

inverting said propagator; and

retrieving said near-surface material information.